

*I claim:*

1. A protection system comprising:

(i) a plurality of Processing Modules arranged in series comprising at least one Protection Processing Module and at least two Working Processing Modules including a protected Working Processing Module;

(ii) a signal path comprising

a Normal Path that is connected to the protected Working Processing Module, and

a Failure Path that is connected to a Processing Module that is logically adjacent to the protected Working Processing Module; and

(iii) a Protection Bus for connecting the Protection Processing Module to the Processing Module logically adjacent to the protected Working Processing Module.

2. The protection system of claim 1, wherein the Protection Bus comprises a plurality of Protection Bus Segments, each Protection Bus Segment associated with at least one Working Processing Module.

3. The protection system of claim 1, wherein, upon failure of the protected Working Processing Module, a connection is formed from the Protection Processing Module to the Failure Path.

4. The protection system of claim 3, wherein the protected Working Processing Module is not adjacent to the Protection Processing Module.

5. The protection system of claim 2, further comprising, for each of  $i = 1$  to  $n$  Working Processing Modules,

an  $i$ th signal path

5 comprising an  $i$ th Normal Path that is connected to the  $i$ th Working Processing Module and  
an  $i$ th Failure Path that is connected to a Processing Module that is logically adjacent to the  
 $i$ th Working Processing Module,

wherein the first Working Processing Module is the Working Processing Module that is adjacent  
to the Protection Processing Module, and the  $n$ th Working Processing Module is the Working  
10 Processing Module that is logically the farthest Processing Module from the Protection  
Processing Module.

6. The protection system of claim 5, wherein the Protection Bus comprises  $n-1$  Protection  
Bus Segments, and, for  $i = 1$ , the  $i$ th Protection Bus Segment connects the  $i$ th Working  
15 Processing Module to the Protection Processing Module, and for  $i = 2$  to  $n-1$ , the  $i$ th Protection  
Bus Segment connects the  $i$ th Working Processing Module to the  $(i - 1)$ th Working Processing  
Module.

7. The protection system of claim 6, wherein, for  $i = 2$  to  $n$ , upon failure of the  $i$ th Working  
20 Processing Module, a connection is formed from the Protection Processing Module to the  $i$ th  
Failure Path via the  $(i - 1)$ th Protection Bus Segment.

8. The protection system of claim 7, wherein the connection formed from the Protection Processing Module to the  $i$ th Failure Path further comprises a switching device associated with the  $(i-1)$ th Working Processing Module.

5 9. The protection system of claim 8, wherein the connection formed between the Protection Processing Module and the  $i$ th Failure Path comprises each Protection Bus Segment logically between the  $i$ th Failure Path and the Protection Processing Module.

10 10. The protection system of claim 7, wherein, for  $i = 1$ , upon failure of the  $i$ th Working Processing Module a connection is formed from the Protection Processing Module to the  $i$ th Failure Path, and the connection does not comprise a Protection Bus Segment associated with a Working Processing Module.

15 11. The protection system of claim 10, wherein the connection formed between the Protection Processing Module and the  $i$ th Failure Path comprises a switching device associated with the Protection Processing Module.

20 12. The protection system of claim 2, wherein the plurality of Processing Modules comprise at least one switching device for connecting the at least one Protection Bus Segment associated with each of the plurality of Processing Modules to at least one other Protection Bus Segment.

13. The protection system of claim 12, wherein the at least one switching device comprises at least one electromechanical switching device.

14. The protection system of claim 12, wherein the at least one switching device comprises at least one optical switching device.

5 15. The protection system of claim 2, further comprising means for configuring the plurality of Processing Modules into a plurality of Protection Groups, each Protection Group comprising at least one Working Processing Module and at least one Protection Processing Module.

10 16. The protection system of claim 15, wherein the configuring means comprises a Network Control Processing Module.

15 17. The protection system of claim 15, wherein the configuring means comprises at least one switching device.

20 18. The protection system of claim 15, wherein the plurality of Processing Modules are configured into a plurality of Protection Groups, each Protection Group comprising at least one Working Processing Module and at least one Protection Processing Module.

19. The protection system of claim 15, wherein the configuring means comprises a Distributed Processor Array.

20. The protection system of claim 19, wherein the Distributed Processor Array comprises at least one of the plurality of Processing Modules.

21. The protection system of claim 2, wherein the plurality of Processing Modules are associated with a backplane.

5 22. The protection system of claim 21, wherein the backplane comprises an electronic circuit board.

23. The protection system of claim 21, wherein the backplane comprises a plurality of slots.

10 24. The protection system of claim 23, wherein at least one of the plurality of slots is specially adapted for use with a Network Control Processing Module.

15 25. The protection system of claim 24, wherein the Network Control Processing Module comprises a Distributed Processor Array.

20 26. The protection system of claim 1, wherein at least one of the plurality of Processing Modules comprises a Distributed Processor Array.

27. A protection system apparatus comprising:

20 (i) a plurality of slots comprising a first slot and a second slot arranged in series, wherein the second slot is logically adjacent to the first slot;

(ii) a signal path comprising

a Normal Path that is connected to the first slot,

and a Failure Path that is connected to the second slot; and

(iii) a Protection Bus comprising at least one Protection Bus Segment for connecting two adjacent slots.

28. The apparatus of claim 27, wherein the plurality of slots further comprise a third slot.

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29. The apparatus of claim 28, wherein the first, second and third slots are configured to accommodate Processing Modules, and wherein, upon failure of a Processing Module in the first slot, a connection is formed through the Processing Module in the second slot to connect the Failure Path connected to the second slot to a Processing Module in the third slot.

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30. The apparatus of claim 29, wherein the first slot is not logically adjacent to the third slot.

31. A protection system apparatus comprising  
n slots; and

n-1 signal paths, wherein for each of  $i = 1$  to n-1 signal paths, the  $i$ th signal path comprises an  $i$ th Normal Path that is connected to an  $i$ th slot, and an  $i$ th Failure Path that is connected to a slot that is logically adjacent to the  $i$ th slot.

32. The apparatus of claim 31, wherein the Protection Bus comprises n-2 Protection Bus Segments, and, for each of  $i = 1$  to n-2 Protection Bus Segments, the  $i$ th Protection Bus Segment connects the  $i$ th slot to a slot that is logically adjacent to the  $i$ th slot.

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33. The apparatus of claim 32, wherein, for  $i = 2$  to  $n-1$ , upon failure of a Working Module in the  $i$ th slot, a connection is formed from the slot that is logically adjacent to the  $(i-1)$ th slot to the  $i$ th Failure Path via the  $(i-1)$ th Protection Bus Segment.

5 34. The apparatus of claim 33, wherein the connection formed from the slot that is logically adjacent to the  $(i-1)$ th slot to the  $i$ th Failure Path further comprises a switching device associated with a Working Processing Module in the  $(i-1)$ th slot.

35. A protection system comprising:

- 10 (i) a plurality of Processing Modules arranged in series comprising at least one Protection Processing Module and at least two Working Processing Modules, wherein at least one Working Processing Module is a protected Working Processing Module, and at least one Working Processing Module is an adjacent Working Processing Module that is logically adjacent to the protected Working Processing Module in the direction of the Protection Processing Module;
- 15 (ii) for each protected Working Processing Module, a signal path comprising a Normal Path that is connected to the protected Working Processing Module, and a Failure Path that is connected to at least one adjacent Processing Module; and
- (iii) a Protection Bus for connecting the Protection Processing Module to the at least one adjacent Working Processing Module.

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36. The protection system of claim 35, wherein each of the Working Processing Modules except for the terminal Working Processing Module is an adjacent Working Processing Module.

37. A protection system, comprising:

a plurality of slots for accommodating a plurality of Processing Modules, each of the plurality of Processing Modules capable of performing a service;

a plurality of Protection Bus Segments, each Protection Bus Segment capable of forming a connection between two adjacent slots;

5 means for forming a Protection Group comprising a plurality of Processing Modules capable of being interconnected in series by a plurality of the plurality of Protection Bus Segments, where the plurality of Processing Modules is fewer than the plurality of slots; and

means for designating a Protection Processing Module within the Protection Group, such that upon failure of a Processing Module in the Protection Group other than the Protection Processing Module, the Protection Processing Module becomes capable of performing the service provided by the failed Processing Module.

38. A protection system method, comprising:

(i) providing at least one Protection Group comprising a Protection Processing Module and at least one Working Processing Module comprising a first Working Processing Module;

15 (ii) providing a segmented Protection Bus operatively linking the Protection Processing Module and the at least one Working Processing Module; and

(iii) providing a signal path comprising a Normal Path that can be connected to the first Working Processing Module and a Failure Path that can be connected to a Processing Module that is logically adjacent to the first Working Processing Module, wherein upon failure of the  
20 first Working Processing Module, a connection is formed from the Protection Processing Module to the Failure Path connected to the Processing Module that is logically adjacent to the first Working Processing Module.